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THE VALUE OF MEASUREMENTS IN DIATHERMY

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In most forms of therapy the term "prescription" implies the introduction or application of an agent to the body with a view to maintaining that agent at an effective level either locally or generally. If "effective level" is the aim, the requisite dosage to attain and maintain it will depend on the rate (1) of absorption, (2) of excretion, and (3) of decomposition of the agent. Accommodation or tolerance may, of course, render a constant level therapeutically ineffective.

With thermal agents the object is to raise the temperature so as to promote biological reactions of value in combating pathological processes. These can be summarized as:

- (a) Vascular responses resulting in an increased rate of blood flow and capable of converting a passive congestion into an active hyperaemia.
- (b) Acceleration of cellular and biochemical activity in accordance with a modification of van't Hoff's law. Defensive processes are primarily aimed at, but pathological ones are also subordinated to this law.

The rise in temperature is related to heat input, heat loss, and possibly—but improbably—to conversion of heat into other forms of energy. In the case of diathermy, the rate at which heat is generated in the tissues is a function of the watts dissipated. It is one of the drawbacks of both long- and short-wave diathermy that no effective means of measuring the temperature in the tissues exists. The operator perforce relies on the patient,

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whose interpretation of his own sensations and of the instructions and warnings issued can be misleading.

The high-frequency ammeter in the patient's circuit of a long-wave diathermy machine is known to give little indication of the temperature reached in the tissues; but it has been assumed that if the rate of energy dissipated in tissues could be measured in watts the problem of dosages would be solved. The experiments described below were aimed at assessing the value of such measurements.

Method and Apparatus

A short-wave generator provided with a wattmeter has been designed and built by Peter Styles in the Department of Physical Medicine, St. Thomas's Hospital. In principle the measuring device is similar to that employed for measuring the energy dissipated from radio-transmission aërials. In a greatly simplified form this can be visualized as consisting of a double bridge circuit in a coaxial transmission line. Appropriate meters measure the total energy directed towards the load on the one hand, and the energy reflected from it on the other; the difference between the two provides a measure of the energy absorbed.

Two factors not met with in radio-transmission complicate the direct adaptation of this principle to therapeutic apparatus: (1) two ordinary cables to connect the electrodes have to replace the coaxial cable, and (2) patients constitute loads of widely divergent characteristics. These call for radical modifications of the original circuit. To make measurements by this method it is necessary to ensure that (a) the frequency of the generator remains constant; (b) the output circuit remains in resonance with the generator; and (c) the load and output impedance are matched. These three conditions are satisfied by using (a) a crystal-controlled master oscillator to drive the power amplifier; (b) a servo-controlled automatic tuning circuit; and (c) variable coupling between the power output stage and the automatically tuned patient's circuit.

After calibration by direct calorimetric methods, the wattmeter was tested for reliability under diverse loading conditions by means of phantoms of various sizes and shapes, and with electrodes in different positions in relation to the load.

Experiments

With a view to comparing the reliability of dosage based on current and on actual energy measurements, two sets of experiments were carried out on the forearms of 53 normal subjects. The forearm was selected because it offered the possibility of confining the whole field to that part of the upper limb and obtain indications of temperature changes in tissues not immediately under the electrodes. For current measurements long-wave diathermy was employed, the electrodes being applied direct to the

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palm of the hand and to the posterior aspect of the arm just above the flexed elbow. Large electrodes were used to ensure that the current density under them did not constitute a limiting factor and that the heat was first felt at the level of the wrist. The current was measured in amperes by means of a reliable radio-frequency meter. The readings were squared to provide figures (I^2) related to power.

For energy measurements the short-wave machine incorporating a wattmeter was utilized. Condenser electrodes were fixed over the dorsum of the hand and over the common origin of the extensor muscles at the elbow with an air space of approximately 1 inch. The subjects were asked to imagine three degrees of warmth: (a) slight but definitely perceptible (S); (b) comfortable (C); and (c) hot verging on discomfort (H). The threshold for each of these was then estimated for every subject with both long- and short-wave diathermy.

Results

The results are shown in Fig. 1. The power levels (in arbitrary units for long-wave and in watts for short-wave diathermy) are measured vertically, while the number of subjects who recognized the indicated degrees of warmth (S, C, and H) at each level is shown horizontally. For instance, it can be deduced from the results for long-wave diathermy that 3 subjects claimed to have perceived a sensation of slight warmth (S) with a current of 0.2 amp., which is recorded vertically as $I^2 = 0.04$ ($0.2^2 = 0.04$); 16 with a current of 0.35 amp., which is recorded as $I^2 = 0.123$; and only one with a current of 0.55 amp., which is recorded vertically as $I^2 = 0.3025$. In this example the extremes (0.3025 and 0.04) make the range factor $\frac{0.3025}{0.04} = 7.55$ for current measurements.

In the Table the ranges and the range factors for each set of experiments are summarized.

TABLE SUMMARIZING RANGES AND RANGE FACTORS

Degree of Warmth	Long-wave Diathermy I^2 (Fig. 1)		Short-wave Diathermy Watts (Fig. 2)	
	Range	Range Factor	Range	Range Factor
Slight but perceptible (S)	0.04-0.3025	$\frac{0.3025}{0.04} = 7.55$	5-50	$\frac{50}{5} = 10$
Comfortable (C)	0.123-0.4225	$\frac{0.4225}{0.123} = 3.45$	20-105	$\frac{105}{20} = 5.25$
Hot verging on discomfort (H)	0.2025-0.68	$\frac{0.68}{0.2025} = 3.35$	50-155	$\frac{155}{50} = 3.1$

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Additional readings were taken during the experiments with long-wave diathermy. They were provided by noting the electromotive force across the electrodes for the various sensory thresholds. On squaring the voltages for the experimental conditions already described it was found that the distribution of the 53 subjects was substantially the same as for current measurements. For this reason these results have been regarded as a double check, but have been omitted from the chart and table.

The wide range in energies required, with both long- and short-wave diathermy, to attain certain subjective effects is apparent. The danger of attempting to prejudge the dosage can be deduced from Fig. 1, where it

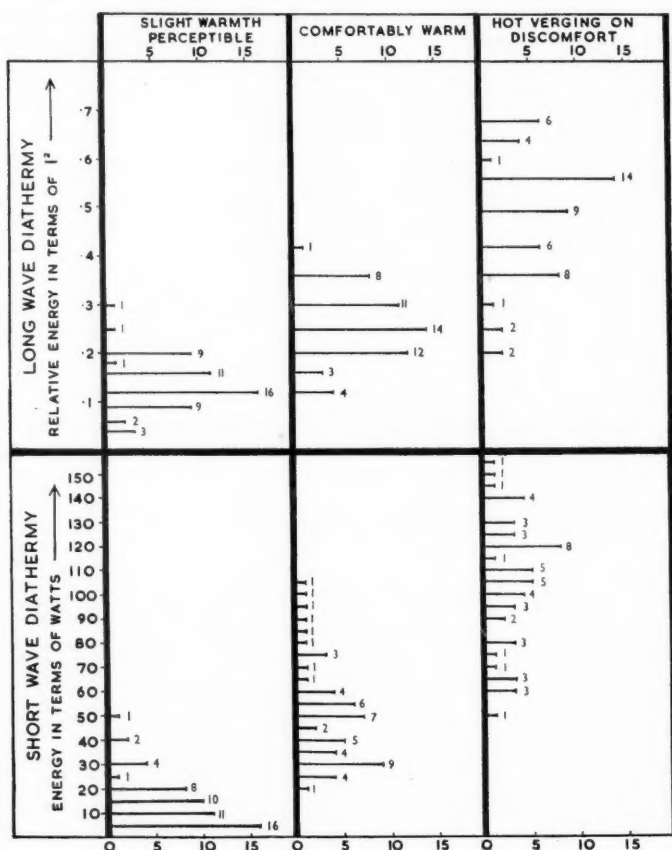


FIG. 1

Graphic representation of results of experiments to assess the reliability of dosage in indicating the temperature reached in the tissues.

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can be seen that an energy dissipation of 50 watts produced a sensation of slight warmth (S) in one subject, of hot verging on discomfort (H) in another, and of comfortable warmth (C) in 7 others.

The discrepancies noted could arise from three causes: (1) individual variations and fluctuations of sensory thresholds; (2) differences in the volume of tissues in the field; and (3) the rate of blood flow through the tissues.

Confirmatory Experiments

To confirm that the rate of blood flow was a dominant factor, not only as from one individual to another but also in the same individual under different conditions, a further set of experiments was conducted with short-wave diathermy on three subjects—A, B, and C. Subjects A and C were selected because they were known to have widely different rates of blood flow in the forearm. The difference, as estimated by the method of Barcroft and Edholm (1943), was in the ratio of 7 to 1.

The results are shown in Fig. 2, where the energy is measured in watts along the ordinates. The three groups of curves were plotted from experi-

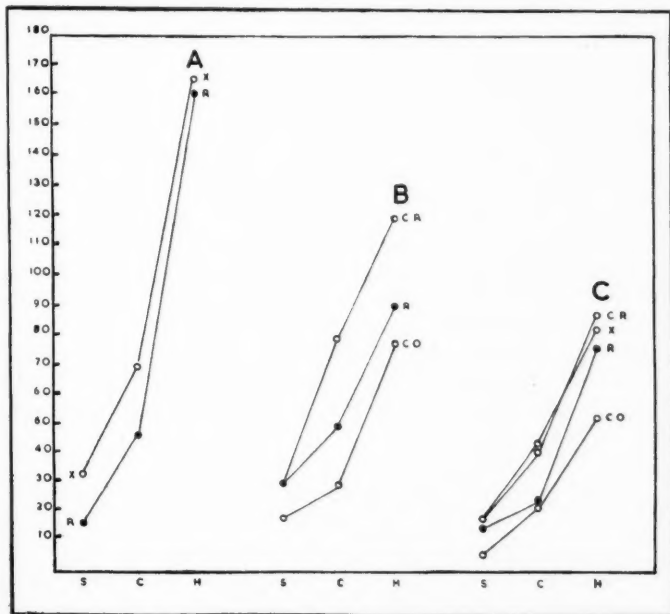


FIG. 2

Graph showing results of experiments to confirm the importance of the rate of blood flow. R, At rest. X, During exercise. CO, Pneumatic cuff on. CR, Pneumatic cuff released.

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ments carried out on A, B, and C under various conditions. Threshold measurements were made at rest (R), during exercise (X), with the arterial supply cut off by means of an inflated pneumatic cuff (CO), and during the reactive hyperaemia following release of the cuff (CR).

It will be seen that the amount of energy required to obtain the desired effect in every case appeared to be related to the rate of blood flow in the individual and the effect of the altered conditions on the blood flow. Exercise and reactive hyperaemia increased the tolerance to heat generated in the tissues, while rest and arterial occlusion decreased it.

Conclusions

It is concluded from the above experiments that no measurements of energy dissipated in tissues can be regarded as a safe guide to the temperature reached in them. For instance, in one individual only one-third the wattage required by another will be needed to raise the temperature of the same limb to the level of "hot verging on discomfort". As anticipated, all conditions which increase the rate of circulation raise the tolerance. Moreover, it is probable that the rise in temperature itself brings about such a change as the result of vasodilatation. Again, whereas in the experiments the forearm was selected because it circumscribed the field, this is not the case in applications to the head or trunk, when further difficulties arise on account of the spread of the field, in an unpredictable way, to structures not directly between the electrodes. Such unavoidable "leakage" makes it impossible to assess in what fraction of the total volume of the trunk or head the accurately measured energy is dissipated.

From our observations it is abundantly clear that until a method of measuring the actual rise of temperature in the tissues is available, it is safer to rely on the patient's sensation, always provided that sensation is normal and the patient fully co-operative, than to introduce energy at predetermined rates, however accurately measured.

The legal implications of this reliance on the patient are inescapable. Where a patient is asked to act as a gauge in treatments fraught with some risks, his share of the responsibility as well as the hazards involved must be made clear to him.

NOTE.—While the experimental work carried out with the specially designed generator brought home both the unreliability and the undesirability, in short-wave therapy, of measurements of energy dissipated, and the hazards of predetermined dosage based on this, subsequent use of the same equipment in routine treatment revealed the undoubted value of the constancy of output afforded by the incorporated automatic tuning device. Most commercially produced short-wave machines rely on manually operated tuning condensers to obtain resonance in the patient circuit. In

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practice this means that movement of the patient in relation to the electrodes alters the loading conditions, which can effect an increase or decrease in power dissipated and lead to either risky or futile treatment.

Summary

Experiments were carried out with long- and short-wave diathermy on the forearm in 53 normal subjects with a view to evaluating the reliability of measurement of energy dissipation and the safety of predetermined dosages in treatment.

The 53 subjects were grouped according to the various levels of energy required to produce three degrees of sensation of warmth, designated S, C, and H. The distribution is shown in a chart and the width of the ranges are summarized as range factors in a table.

The results of further experiments emphasize the importance of the part played by the rate of the circulation and explain the discrepancies noted.

It is concluded that, although reliance on subjective sensations may appear unscientific, it is safer than administration of predetermined quantities of thermogenic energy; but the legal aspect must not, however, be overlooked.

Incidentally, it is noted that the automatic tuning device of necessity incorporated in the short-wave equipment is likely to prove of greater value in routine short-wave therapy than the wattmeter. Although the wattmeter was the primary consideration at the onset, the self-tuning device, by compensating for varying loading conditions, in practice enhanced the efficiency, safety, and flexibility of the machine.

Acknowledgment

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THE USE OF RADIOACTIVE ISOTOPES IN RESEARCH IN PHYSICAL MEDICINE

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A SERIOUS criticism of physical medicine is that the physiological basis of many physiotherapeutic techniques in common use is not fully understood. Moreover, these techniques are used in an empirical way in the treatment of conditions in which clinical assessment is particularly difficult and unreliable. Many of them—for example, treatment by various forms of heat, iontophoresis, and anodal galvanism—are believed to exert their clinical effects by causing local alterations in circulation. The use of radioactive isotopes as “tracers” to measure changes in tissue circulation provides a relatively simple method of investigating many such problems in physical medicine. The technique is in wide use in other branches of medicine, and many papers of interest have already been published.

Methods

Three different techniques are available. These have two factors in common: (1) that radioactive material can be accurately measured, and (2) that radioactive isotopes of substances normally present in living tissue can easily be introduced, without causing damage, into any tissue to be studied. The simplest radioactive isotope to use is that of sodium (Na^{24}) in the form of the salt, sodium chloride (Na^{24}Cl), made up in physiological saline. The three most usual techniques in which it is employed are: (a) tissue concentration; (b) tissue clearance; and (c) rate of venous flow. (For full details the relevant papers should be consulted; or see *Brit. med. Bull.*, 1952, 8, No. 2–3.)

(a) TISSUE CONCENTRATION

This technique was introduced by Smith and Quimby (1945) as a method of measuring peripheral blood flow and as a qualitative test of peripheral circulation. It has been applied to the study of peripheral vascular disease.

Radioactive sodium made up as physiological saline is injected intravenously into the arm, and its presence detected peripherally by Geiger-Müller tubes attached to standard counting and recording equipment. The isotope pick-up by twin Geiger-Müller tubes at the soles of the feet is measured, and any qualitative difference in the counting rate at the two sites is a measure of the difference between the total blood flow of the two

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feet. This can be used both as a diagnostic test, and serially to measure improvement brought about by treatment—e.g. heat, sympathectomy.

The main disadvantage of this technique is that large doses of radioactive isotope have to be used, and the whole body is exposed to a radiation intensity equal to that necessary for a small segment under study. Consequently it has largely been abandoned for clinical work.

(b) TISSUE CLEARANCE

Kety (1949) proved theoretically, and also clearly demonstrated by experiment on human subjects, that the rate at which a freely diffusible substance, such as sodium, was removed from a tissue was "a quantitative measure of the total ability of the local circulation to remove and, by the same token, to supply freely diffusible substances", and was thus a measure of local tissue circulation.

A small quantity of Na^{24}Cl ($5 \mu\text{c.}$ in 0.5 to 1.0 ml. of isotonic saline was originally used) is injected into the tissue studied—skin or muscle—by a fine needle. The injection site is viewed through a shielded, directional Geiger-Müller tube, and counts recorded at one-minute intervals until the counts per minute become too low for significant measurement. The count tails off to a final plateau (the "background" count), and when the count per minute, less background, is plotted against time an exponential curve is obtained. Alternatively, this relationship may be expressed by plotting the corrected minute count semi-logarithmically against time. A straight line can be drawn through the resulting points, and the slope of this, K , the clearance constant, is a measure of the rate of tissue clearance. If nothing is done to influence the circulation, this curve is a straight line, and K remains constant for as long as sixty minutes.

Kety further demonstrated that the effect of applying an arterial tourniquet was to produce a complete standstill in tissue clearance, which was followed by a reactive hyperaemia, indicated by an increased K . He also showed an increase in clearance from muscle during and after exercise, and a reduced clearance when vasoconstrictor drugs were administered. These changes are similar to, and of the same order as, those found by plethysmography. These investigations have been repeated by many workers, and the reliability of the method is firmly established.

(c) VENOUS FLOW RATE

The technique of Wright, Osborn, and Edmonds (1948) is as follows: 0.2 to 1.0 ml. of physiological saline containing the equivalent of 2 to $5 \mu\text{c.}$ Na^{24}Cl is injected intravenously into the foot under standard conditions of temperature, rest, and posture. A screened Geiger-Müller tube placed over the femoral triangle detects the moment of arrival of the radioactive material. The time taken to travel the measured distance from foot to groin is thus found, and from this the venous flow rate is calculated.

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Applications

Some examples of the application of these techniques to problems related to physical medicine are given below. It should be emphasized that this is by no means a comprehensive survey, but is given only to indicate the scope of the method. The tissue clearance technique has been most widely used and, unless otherwise stated, is the method which was employed in the experiments described.

1. INTERFERENCE WITH BLOOD SUPPLY

(a) *Arterial Occlusion*.—Complete arterial occlusion (tourniquet) is followed by hyperaemia (Kety). Our own results (Harris, Martin, and Williams, unpublished) suggest that in the poorly vascularized limb the duration of the hyperaemia is longer, but of a lower order, than in the normal limb. This may prove of value both in prognosis and in the assessment of progress.

(b) *Venous Occlusion*.—During the application of a tourniquet tight enough to interfere with venous return the clearance rate from both skin and muscle decreases. Removal of the tourniquet is not followed by any measurable hyperaemia (McGirr, 1952a). This is in agreement with our own findings, although with continuous recording apparatus we have occasionally noted a transient and slight hyperaemia within the first two minutes following the removal of a venous tourniquet.

McGirr (1952b) came to the conclusion that the transitory hyperaemia which may be found rarely compensated for the decreased circulation during occlusion, and for this reason intermittent venous occlusion was unlikely to be of value in the treatment of intermittent claudication.

(c) *Sympathectomy and Sympathetic Block*.—No significant alteration in the clearance rate of resting calf muscle after sympathectomy was detected by Reese, Darrow, and Cullen (1951). The effect of exercising such subjects was not studied.

2. ALTERATION IN TEMPERATURE

Both heat and cold produce profound effects on skin circulation (McInally, Campbell, Robertson, and Douglas, 1952). In general, the clearance rate is increased by heat and decreased by cold. The effects of temperature on muscle are much less than (McGirr, 1952a), and often the reverse of (Harris, Martin, and Williams, 1952), skin vascular changes. This is true both for "reflex" and for direct heating, and in fact a prolonged decrease in blood flow to peripheral muscle may accompany the application of heat to the trunk (Harris *et al.*, 1952). These findings do not support the traditional methods of attempting to increase blood supply to ischaemic muscle by "reflex" heating; they also demonstrate that skin temperatures correlate well with changes in skin circulation, but are of little value in determining the vascular supply of underlying muscle.

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3. EFFECT OF EXERCISE

(a) Exercise produces a great increase in muscle clearance rate, and is followed by a pronounced hyperaemia, the duration of which depends upon the severity of the exercise. In grossly ischaemic limbs the increase during and after exercise was less than in the normal limb (Kety).

(b) According to Reese *et al.* (1951) the clearance of the antagonist muscle is decreased during exercise, and we have confirmed this finding. This suggests that in attempting to increase the blood supply of a muscle by controlled exercise it is important that the antagonist muscle be rested.

(c) Muscle exercise brought about by electrical stimulation gives an increase in clearance during and following the stimulation, of the same order as that found after voluntary exercise (McGirr, 1952a).

4. MASSAGE

Ebel and Wisham (1952) studied the effect of massage on the clearance rate from muscle and correlated this with measurements of intramuscular temperature. They were unable to find any significant alteration in these two factors, and concluded that "massage is not an effective method for increasing blood flow in muscle".

5. DRUG INJECTIONS

McGirr (1952a) demonstrated that the direct injection of adrenaline into muscle caused a decrease, and injection of histamine an increase, in the clearance rate. He found similar results when the same drugs were injected into skin (personal communication).

6. IONTOPHORESIS

Harris *et al.* (1953), using the technique and dosage commonly employed in clinical practice, studied histamine iontophoresis in both skin and muscle. They found a considerable increase (threefold) in skin clearance, but no change in clearance rate occurred in muscle deep to the active electrode until systemic effects, such as flushing and headache, were produced; a small transient increase in clearance rate was then observed.

7. PASSAGE OF A DIRECT CURRENT

Passing a direct current ("anodal galvanism") produced a small increase in skin clearance rate, but no change in underlying muscle at a depth of 1 cm. (Harris *et al.*, 1953). In this investigation also the technique and dosage were similar to those used in clinical practice.

8. PREVENTION OF VENOUS STASIS

Factors considered to be of possible importance in causing and preventing venous stasis have been studied by the venous flow rate technique by Wright and Osborn (1952), whose findings were as follows:

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(a) In bed-ridden surgical patients a progressive decrease in venous flow rate occurs in the lower limbs which is not found in the "early ambulant" case.

(b) Raising the foot of the bed to an angle of ten degrees with the subject lying horizontally doubled the venous flow rate in the legs. They suggest that this finding could be applied with advantage in the prevention of thrombosis in immobilized patients.

(c) Vigorous dorsiflexion and plantar flexion of the foot for two minutes increased the venous flow rate to between two and three times that in the supine position. In this connexion they state: "It is of interest that such a profound change should be produced by so small a movement as dorsiflexion and plantar flexion of the foot, and it appears that this simple exercise offers a satisfactory method of ensuring a rapid venous flow rate in those patients who must be kept recumbent. Even the old and the frail or the seriously ill can be required several times a day to perform the simple pedalling movement shown here to be so effective in controlling stasis."

Discussion

The above examples are sufficient to indicate that information of fundamental importance to physical medicine can be obtained from the use of radioactive isotopes. It is to be regretted that little of this work has been done by anyone directly concerned with our branch of medicine.

The techniques are simple, and recent advances, such as the use of scintillation counters, of geometrically arranged counting systems, and of smaller volumes of injected fluid, have further increased the reliability of the results. An important point, which makes experiments easier to plan and to perform, is the symmetry of clearance rate from similar sites, so that one limb may be used as a control while an experimental manoeuvre is performed on the opposite limb (Harris *et al.*, 1952a). We have recently extended the determination of clearance rate to the study of joints, and have also confirmed the report of Rapaport, Saul, Hyman, and Morton (1952) that radioactive iodine (I^{131}) is as satisfactory as radioactive sodium for tissue clearance study. I^{131} has certain advantages, particularly its longer half-life. Its use is rapidly becoming a routine in the diagnosis and treatment of thyroid disorders; consequently, as the equipment used for these purposes needs little adaptation for the radioactive isotope clearance technique, suitable equipment should be available in most large hospitals.

Summary

1. The three principal techniques by which radioactive isotopes can be used to measure changes in peripheral circulation are: (1) tissue concentration; (2) tissue clearance; and (3) rate of venous flow.

2. The basic physiological changes induced by many physiothera-

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peutic measures are believed to be alterations in local circulation. It is suggested that the radioactive isotope technique provides a simple experimental tool for investigating such changes.

3. The method has been applied to the study of problems of interest to physical medicine, including the local effects of vascular occlusion, temperature change, exercise, electrical stimulation of muscle, massage, iontophoresis, and protracted immobilization in bed.

4. The results confirm the value of controlled active exercise, but indicate that the rationale of many well-established forms of physiotherapy, such as intermittent venous occlusion, iontophoresis, and massage, needs careful investigation.

5. These techniques are simple to use and within the capability of any large modern hospital. A plea is made that research of this type should be undertaken by physical medicine departments.

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BRACHIALGIA

CLINICAL OBSERVATIONS IN 104 CASES

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IN the course of the last two decades "idiopathic sciatica" has almost entirely lost its original meaning and has been reduced to a complex of symptoms of various underlying diseases. In nearly all cases the cause of sciatica can be firmly established, the most frequent being herniation of a lumbar intervertebral disk.

In recent years a similar attitude has been adopted by many authorities towards pain in the shoulder girdle and upper limb (Beyer and Wright, 1951; Elliot and Kremer, 1945; Haggart, 1948; Hanflig, 1943; Shulman, 1949). It seems probable that brachialgia, like sciatica, should be regarded as a symptom which may be caused by many factors. Diagnosis of the cause is in most instances possible only as the result of a thorough and accurate examination. It is the purpose of this paper to classify clinically and to clarify the causes of brachialgia.

In Table I an attempt is made, without any pretence at completeness, to classify the varied pathological conditions which may give rise to the clinical picture of brachialgia.

Material

A survey was carried out on patients attending the physical medicine out-patient department of the Rothschild-Hadassah-University Hospital, Jerusalem, and the private clinic of one of the authors (E. A.). We purposely excluded patients with purely local affections, since these cases do not conform to our conception of brachialgia because of the local character of the pain; certain problems pertaining to some of the structures involved have been discussed elsewhere (Adler and Grosman, 1946; Adler, 1948). We also excluded patients with Raynaud's disease, Buerger's disease, arterial embolism, shoulder-hand syndrome after myocardial infarction, peripheral nerve involvement, tumours of the spinal cord, and dermatomyositis, as these diseases necessitated admission to other hospital departments. This left for study 270 patients with brachialgia observed in the course of two years. As often happens in out-patient departments, several patients attended once only, and thus did not satisfy the minimum requirements of this investigation.

Of the 270 patients, 104—74 females and 30 males—were found to be suitable for study. The disproportion between the sexes is probably not

Brachialgia

TABLE I

CLINICAL SYNDROMES RELATED TO BRACHIALGIA
(excluding affections of arm joints and adjacent tissues)

A. *Site in Cervico-thoracic Cord, Spine, and Nerve Roots*

1. Degenerative systemic spinal cord disease
2. Tumours of spinal cord
3. Protrusion and/or rupture of intervertebral disk
4. Rheumatoid arthritis and spondylitis ankylopoietica
5. Osteoarthritis of cervico-thoracic spine
6. Radiculitis (including herpes zoster)
7. Congenital and traumatic conditions

B. *Affections of Sympathetic Nervous System*

8. Reflex dystrophy (shoulder-hand syndrome, Sudeck's atrophy)
9. Raynaud's disease
10. Buerger's disease

C. *Site in Supraclavicular Groove*

11. Cervical rib
12. Costo-clavicular compression
13. Scalenus anticus syndrome
14. Hyperabduction syndrome

D. *Site Distal from Shoulder*

15. Thrombosis of axillary vein
16. Arterial embolism
17. Peripheral nerve involvement
18. Myalgia (fibrositis, myofascitis, and similar affections)
19. Dermatomyositis
20. Nodular panniculitis (Weber-Christian's disease)

E. *Miscellaneous*

21. Neurosis

significant, as it corresponds to the over-all distribution of patients attending our services. The age distribution was as follows: 11-20 years, 2; 21-30, 5; 31-40, 19; 41-50, 37; 51-60, 27; 61-70, 10; 71-80, 4. The average age was 47 years, the youngest patient being a girl of 17 and the oldest a woman of 76, both with protrusion of a cervical intervertebral disk. Only 25 patients were under the age of 40, the large majority belonging to the age group 41-60. As regards racial distribution, 72 were of Ashkenazy, 21 of Oriental, and 11 of Sephardi extraction. This again was in conformity with the general over-all distribution of our patients.

Table II presents a diagnostic survey of the underlying diseases giving rise to brachialgia, with coexisting conditions, in the 104 cases studied, and is so constructed as to demonstrate the occurrence of a single condition or of a combination of conditions in the same patient. Since two or more conditions frequently occur in one patient, the total number of diagnoses

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exceeds the total number of patients. It is evident from the table that the majority of cases come under the headings of cervical intervertebral disk protrusion, cervical spondylarthrosis, and reflex dystrophy.

Cervical Intervertebral Disk Protrusion and Spondylarthrosis

The clinical diagnosis of disk protrusion was based on a history of recurrent attacks of brachialgia, usually becoming progressively more severe and more prolonged. Suggestive features were: (1) continuous pain of root character, respectively aggravated and alleviated by manœuvres which increased or decreased pressure on the nerve root; (2) marked tenderness on percussion over one or two cervical vertebrae; (3) the combination of paraesthesiae of segmental distribution with neurological signs. Lack of evidence of infectious or obvious metabolic disease or of vasomotor disturbances was regarded as additional support for this diagnosis.

Many cases with the above clinical features in a minor degree and less clearly defined were classified as cervical spondylarthrosis because of the finding of diffuse osteoarthritis in the cervical spine on X-ray examination. In over one-quarter of the cases in which X-ray changes were present, more than one intervertebral space was affected.

Originally when preparing this paper we compiled separate tables for prolapsed intervertebral disk and cervical spondylarthrosis, setting out therein the different clinical features and the number of cases in which each feature appeared. On study of these tables a striking parallel was found in the figures, and it became apparent that the two diseases were often indistinguishable on clinical grounds. Thus it was found that the average age of the patients was the same (rather higher than in other patients in the series). Both upper limbs were equally affected, with a slight preponderance on the right side, with spondylarthrosis. In both groups pain was felt over the back of the neck and the shoulders. Paraesthesiae were encountered in both conditions, though more frequently in the case of disk protrusion. Vasomotor signs or differences in blood pressure in the two arms were rare in either group. Neurological signs were more frequently found with disk protrusion.

Reflex Dystrophy

In Table III are presented the findings in 10 cases of reflex dystrophy. It will be seen that the average age in this group is higher (56 years) than in the first two groups, the youngest patient being 46. It is of interest to note that in these cases pain, which was severe, affected mainly the hands and shoulders, the neck and arm often not being involved. Signs of reflex dystrophy are: vasomotor disturbances, restriction of movement in hand and shoulder, and Sudeck's patchy atrophy of the carpal bones; these were encountered in almost every case. Physical treatment gave relief in 6 of these cases.

TABLE II

MAIN DIAGNOSIS AND ACCOMPANYING CONDITIONS IN 104 CASES OF BRACHIALGIA

Main Diagnosis	Main Diagnosis	One Diagnosis Only	Cervical Disk Protrusion	Cervical Spondylarthrosis	Reflex Dystrophy	Cervical Rib	Neurosis	Myalgia	Hyperabduction Syndrome	Costo-clavicular Compression	Injury to Cervical Spine	Herpes Zoster	Spondylitis Ankylopoietica	Syringomyelia	Referred Pain (Cholecystitis)	Frozen Shoulder	Diabetic Radiculitis	Scalenus Anticus Syndrome	Long Transverse Process	Non-diabetic Radiculitis	Spina Bifida	Nodular Panniculitis	TOTAL
Main Diagnosis			46	24	7	6	4	3	2	2	2	1	1	1	1		2	1				1	104
One Diagnosis Only			32	14	7	4	4	3	2	2	1	1	1	1	1								
Cervical Disk Protrusion	46	32		7												3	1	1	1		1		46
Cervical Spondylarthrosis	24	14	7		1	1										6	3	1					33
Reflex Dystrophy	7	7		1							1											1	10
Cervical Rib	6	4		1						1						1							7
Neurosis	4	4																					4
Myalgia	3	3																					3
Hyperabduction Syndrome	2	2																					2
Costo-clavicular Compression	2	2				1												1					4
Injury to Cervical Spine	2	1			1																		2
Herpes Zoster	1	1																					1
Spondylitis Ankylopoietica	1	1																					1
Syringomyelia	1	1																					1
Referred Pain (Cholecystitis)	1	1																					1
Frozen Shoulder			3	6		1											2						12
Diabetic Radiculitis	2		1	3												2							6
Scalenus Anticus Syndrome	1		1	1						1										1			4
Long Transverse Process			1																				1
Non-diabetic Radiculitis																		1					1
Spina Bifida			1																				1
Nodular Panniculitis	1				1																		1
TOTAL	104		46	33	10	7	4	3	2	4	2	1	1	1	1	12	6	4	1	1	1	1	141

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TABLE III

REFLEX DYSTROPHY (SHOULDER-HAND SYNDROME; SUDECK'S ATROPHY)

<i>Total Number of Cases</i>	10
<i>Average Age</i>	..	..	..	..	..	56 years
<i>Sex Distribution:</i>						
Male	..	..	..	..	..	3
Female	..	..	..	..	..	7
<i>Aetiology:</i>						
Traumatic	..	..	..	..	..	7
Phlegmon	..	..	..	..	..	1
Spondylarthrosis	..	..	..	..	..	1
Nodular panniculitis	..	..	..	..	..	1
<i>Side Affected:</i>						
Left	..	..	..	..	..	4
Right	..	..	..	..	..	6
<i>Localization of Pain:</i>						
Cervical spine	..	..	..	..	..	1
Supraclavicular groove	..	..	..	..	..	2
Shoulder	..	..	..	..	..	8
Upper arm	..	..	..	..	..	4
Forearm	..	..	..	..	..	4
Hand	..	..	..	..	..	10
<i>Restriction of Movement:</i>						
Shoulder	..	..	..	..	..	7
Hand	..	..	..	..	..	9
<i>Paraesthesiae</i>	..	..	..	..	..	5
<i>Vasomotor Signs</i> (swelling, change in colour)	..	..	..	..	..	9
<i>X-ray Findings:</i>						
Patchy atrophy	..	..	..	..	..	8
Unavailable	..	..	..	..	..	2
<i>Results of Treatment:</i>						
Improved	..	..	..	..	..	7*
Not improved (nodular panniculitis)	..	..	..	..	..	1
Unknown	..	..	..	..	..	2

* Removal of foreign body, 1; stellate ganglion infiltration, 4; circular procaine infiltration of humerus, 2.

Cervical Rib; Scalenus Anticus Syndrome; Costo-clavicular Compression Syndrome; Hyperabduction Syndrome

There were 6 cases of cervical rib and 1 case of long transverse process of the 7th cervical vertebra. Of these 7 patients, 6 were females. Their ages were rather lower than in other groups, being between 17 and 52 years. Two cases had bilateral anomalies, but with symptoms on one side only. Pain was not encountered in the cervical spine, but was more or less uniformly distributed from the shoulder downwards. Paraesthesiae were noted in 4 cases, neurological signs in 3, vasomotor signs in 2, and difference in blood pressure in the two arms in 1 case. In 4 cases

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different positions of the arm and neck influenced pulse or blood pressure. In 4 cases also symptoms were relieved by postural exercises.

In the majority of cases of scalenus anticus syndrome or costo-clavicular compression syndrome there was an association with other basic disturbances (see Table II). On the other hand, the hyperabduction syndrome appeared as a single entity in 2 patients. Both of them had the habit of sleeping with their hands up and were benefited when, on advice, they discontinued this practice. Females only were affected with these three syndromes. The average age was comparatively low (31 years). All patients either had differences in blood pressure in the two arms or showed variations in pulse or blood pressure with changes in position of the arm. The majority had neurological signs and paraesthesiae. This group appeared to derive much benefit from postural exercises and re-education.

Syringomyelia and Frozen Shoulder

It is not necessary for our present purpose to discuss in detail the other diagnoses listed in Table II except those of syringomyelia and frozen shoulder.

In the single case of syringomyelia the patient complained of severe stabbing pains along the entire length of the arm, and X-ray examination revealed a typical Charcot's joint of the shoulder. There was no limitation of movement in this joint, but the dissociated sensory disturbances characteristic of this disease were present.

Since the stiff, painful shoulder commonly known as frozen shoulder is in many cases a local condition, it was not included in our series except where it constituted an apparently secondary condition. This was observed in more than 10% of all our cases, six times with cervical spondylarthrosis alone. Physical measures were of little or no benefit.

Discussion

The relatively high average age of the patients with cervical intervertebral disk protrusion, cervical spondylarthrosis, and reflex dystrophy would seem to suggest that wear and tear, and perhaps metabolic factors, play a major role in the aetiology of these affections. This is borne out by the high incidence among our patients (26 cases) of these conditions at the menopause, and by the fact that 6 patients had diabetes mellitus.

According to our observations, brachialgia is, on the whole, discogenic in origin. Taking into account the parallelism of figures and findings in cervical intervertebral disk protrusion and cervical spondylarthrosis, it seems probable that a number of the cases appearing under the latter heading actually belong to the former, having been listed under cervical spondylarthrosis for lack of sufficient X-ray and clinical evidence. Distinction should be made between a protrusion which is part of a slowly progressing degenerative process in the nucleus pulposus, and an acute

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traumatic rupture of the annulus fibrosus with or without herniation of the pulp.* Almost all cases dealt with in this paper are of the protrusion type. Cases of acute rupture of a cervical intervertebral disk are not generally seen in a physical medicine out-patient department, except occasionally when the patient presents himself because of "acute torticollis". A ruptured disk may sometimes simulate angina pectoris or even myocardial infarction (Semmers and Murphy, 1943; Josey and Murphy, 1946), and cervical intervertebral disk protrusion may also be mistaken for anginal pain. As many as six patients in our series who had previously been treated for angina pectoris proved to have a protruded disk and responded favourably to our usual treatment for this condition. No evidence of myocardial involvement was found electrocardiographically in these cases even when using the Master test.

It is worthy of mention that pains in the upper extremity in cervical spondylarthrosis were associated particularly with distinct arthrotic changes within the intervertebral foramen as shown by X-ray examination; however, distinct arthrotic changes were often found in patients with relatively slight subjective complaints. We believe that spondylarthrosis causes pain during its early development rather than in its final stage.

It has now been established that reflex dystrophy is a disease of sympathetic origin (Steinbroker *et al.*, 1948). Its occurrence is not necessarily connected with trauma, and in 3 out of the 10 cases in our series there was no traumatic aetiology. In one of these, a case of nodular panniculitis (verified by biopsy), a severe reflex dystrophy of the right arm developed. Neither the underlying disease nor this complication responded to physical or medical treatment (including cortisone). The patient refused infiltration of the stellate ganglion with procaine hydrochloride.

Restriction of movement is a common feature in reflex dystrophy, particularly in its advanced stages. In 7 of the 10 cases movement in the shoulder-joint was restricted (Table III), and 9 out of the 10 patients had stiffness of the hand. There were 12 cases of clear-cut frozen shoulder among the 104 cases of brachialgia. It is of interest to note that 6 of these 12 and 1 case of shoulder-hand syndrome (with no previous trauma) were related to cervical spondylarthrosis. This high incidence of frozen shoulder requires explanation. In addition to the immobilization imposed by the pain, there is good reason to believe that a sympathetic reflex mechanism, possibly of secondary origin, plays a major role in the development of this complication. It is even likely that in many cases frozen shoulder represents a minor form of reflex dystrophy. This postulated sympathetic background might be the factor linking severe deep pain of coronary origin, the angina-like disturbances connected with changes in the cervico-thoracic

* This statement is in conformity with the views of Dr. L. Davidoff of the Mount Sinai Hospital, New York, on the problem of cervical intervertebral disk protrusion expressed during a clinical conference at the Hadassah-University Hospital, Jerusalem, in the summer of 1951.

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spine, and the frozen shoulder or shoulder-hand syndrome associated with one of the former or with other conditions. The relatively rare combination of reflex dystrophy with conditions which are potentially causative but so often met with in the absence of reflex dystrophy leads to the assumption that there is a further factor, be it constitutional, emotional, or pathological.

Differentiation between the syndromes originating in the supraclavicular groove presents many difficulties. Vasomotor signs are certainly important, but they cannot be relied upon to make the distinction clear. Moreover, variations in pulse pressure in different positions of the arms, differences in blood pressure as between the two arms, and the full exploitation of manœuvres such as Adson's (1947) and the exaggerated "attention" position (Eden, 1939) only rarely assist the diagnosis. Positive findings with these tests are encountered even in apparently healthy subjects (Falconer and Wedell, 1943; Gamble, 1951). However, the finding of one or more of the above signs in cases of brachialgia directs attention to the supraclavicular groove. If we are fortunate enough to find a cervical rib, we may feel excused from looking for other causes. A cervical rib, however, does not necessarily produce clinical symptoms and signs. The hyperabduction syndrome is perhaps the easiest to diagnose by good history-taking *ex juvenibus* (Beyer and Wright, 1951; Haggart, 1948). The scalenus anticus group of affections does not always show clear-cut neurological signs as described by Swank and Simeone (1944), and in the long run only a "novocain" test on the scalenus muscle may prove decisive. According to some observers, however, this test, as well as successful scalenotomy, does not exclude protrusion of a cervical intervertebral disk (Haggart, 1948; Shenkin and Groff, 1950) or other conditions as the primary cause of the pain. The situation is further complicated by the fact that with all these syndromes there is a tendency to periodic attacks, although the anatomical anomalies are irreversible. This was well exemplified in a case of cervical rib in which there were severe attacks of pain, swelling of the whole arm and hand, and paraesthesiae which lasted for some days and occurred approximately twice a year; in the intervals the patient was entirely symptom-free. Of the four syndromes originating in the supraclavicular groove, the costo-clavicular compression syndrome is the most difficult to diagnose without surgical intervention and in the absence of a Pancoast tumour.

Under the heading of myalgia only 4 cases were listed. In all these the patient complained of pains over a large area of the arm below the shoulder-joint, the muscles in this area being very tender on pressure. All symptoms were rapidly relieved by heat treatment.

Finally, we would stress that only 4 patients in this group could be regarded as neurotic. They did not react to physical treatment, their symptoms were alleviated by "nervinal", and 2 of them showed striking

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improvement after psychotherapy. In this connexion it is worth mentioning that pains of a neurotic character, or at least neurotic reactions to existing pains of definitely physical origin, are much more frequently encountered in patients with low back pain than in those with brachialgia (except that of the angina-like syndrome). No doubt there is a close psychological connexion between the back and the sexual function; this might explain the disparity between the neurotic reactions in two otherwise so similar conditions. In our series as many as 10% showed definite depressive symptoms.

Summary

1. Brachialgia, like sciatica, is not a disease entity, but a symptom of many pathological conditions.
2. The case notes of 104 ambulatory patients with brachialgia were analysed in an attempt to classify the main and associated causes.
3. Of the 104 cases 70 (67%) were grouped under the diagnoses of prolapsed intervertebral disk and cervical spondylarthrosis.
4. There is a striking parallel in findings as between the cases diagnosed as cervical intervertebral disk protrusion and cervical spondylarthrosis. It is suggested that they are both part of the same pathological process.
5. Reflex dystrophy was the diagnosis in 10 (9.6%). A relation between this condition and frozen shoulder is postulated.
6. Other conditions which gave rise to brachialgia were: cervical rib, scalenus anticus syndrome, costo-clavicular compression syndrome, hyperabduction syndrome, and syringomyelia.
7. More than one pathological condition was found in 29 cases.

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THE AMERICAN CONGRESS OF PHYSICAL MEDICINE ANNUAL SESSION, 1952

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THE thirtieth annual scientific and clinical session of the American Congress of Physical Medicine met in New York City from August 25 to 29, 1952. Although it was held during the dog days of late summer with their characteristic humid, sultry, oppressive weather, the spirit of the meeting was characterized by enthusiastic interest in imparting and assimilating new information on and new approaches to the problems of a relatively young and rapidly growing specialty. The general programme of the session included two business meetings, the scientific sessions, the instruction seminar, the presidential address, the annual dinner, the Coulter Memorial Lecture, the educational conference, and the scientific and technical exhibits.

More than 700 members, visitors, and guests registered, and certain sessions were attended by over 1,000 persons. The 650 members of the American Congress are physicians interested in physical medicine and rehabilitation. It is not necessary to be a full-time specialist or a diplomate of the American Board of Physical Medicine and Rehabilitation to qualify for membership of this organization.

Business Sessions

The two business sessions were presided over by the President of the Congress, Dr. Robert L. Bennett. The most important item of business was the change of name of the American Congress of Physical Medicine. In keeping with the expanding scope of this field, the new name of the organization is "The American Congress of Physical Medicine and Rehabilitation". This name parallels those of the American Society of Physical Medicine and Rehabilitation, which is the organization made up of full-time specialists in this field; the American Board of Physical Medicine and Rehabilitation; and the Council of Physical Medicine and Rehabilitation of the American Medical Association. The *Archives of Physical Medicine*, the official journal of the American Congress, is changing its name to the *Archives of Physical Medicine and Rehabilitation*.

Eighteen regular and special committees of the Congress made reports at the business sessions. The following list of a few of the committees reporting indicates the varied interests and activities of the members of this Congress: advances in education; balneology and health resorts; co-operation with the Air Force, Army, Navy, Public Health Service, and Veterans Administration; co-operation with the Food and Drug Administration;

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medical economics; and to foster, encourage, and co-ordinate research projects. Dr. W. M. Solomon, of Cleveland, Ohio, was elected president, and Dr. W. B. Snow, of New York, president-elect.

General Scientific Sessions

Fifty-two papers were read at the scientific sessions, and seventeen others were presented by title only. These represented the reports of research and study by approximately a hundred workers from all parts of the United States, and covered the various facets of the entire field of physical medicine and rehabilitation. Six papers were presented as part of a symposium on ultrasonic energy. These included reports on basic research on the effects of ultrasound as well as evaluations of the clinical effectiveness of this form of energy. A healthy balance between enthusiasm and conservatism was maintained by the various speakers. Valuable presentations on basic physiological research were made from a number of university and research centres.

Another outstanding contribution was the symposium on rehabilitation, which dealt with the problems of the hard of hearing, speech training for aphasics, problems of patient evaluation by psychological tests, and the rehabilitation of lobotomized patients. The importance of, and methods used in, guiding the disabled housewife in a practical work programme in the home were described. Follow-up studies in rehabilitation were reported from one of the leading rehabilitation centres in the United States.

Instruction Seminar

The instruction seminar has become a prominent part of the annual sessions of the American Congress of Physical Medicine. It is sponsored by the Committee on Education under the chairmanship of Dr. Earl C. Elkins, and consists of two series of eight fifty-minute lectures and demonstrations by outstanding teachers from various medical centres. One series of lectures was devoted primarily to basic science subjects pertaining to the field of physical medicine and rehabilitation, while another dealt primarily with clinical applications in physical medicine and rehabilitation. A registration of 515 persons for the classes indicates the popularity of the instruction seminar.

Among the subjects presented were the following: vocational counselling; functional anatomy of the spine; present status (experimental) of ultrasonics; modern upper extremity prosthesis and rehabilitation of upper extremity amputees; electromyographic studies of poliomyelitis; and basic mechanical and muscular elements in pathological gait.

Educational Conference

At the annual educational conference, over which Dr. Earl C. Elkins presided, papers were presented on undergraduate instruction in physical

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medicine and rehabilitation and on university-sponsored graduate fellowship training in medical specialties, and a report was made of the activities of the advisory committee on education of the Council on Physical Medicine and Rehabilitation of the American Medical Association. This conference, with its formal and informal discussions, is of particular interest to physicians supervising residency and fellowship programmes as well as those concerned with the training of physical therapists.

Presidential Address

In his presidential address, entitled "The Training of the Physiatrist", Dr. R. L. Bennett emphasized that new trends are appearing in the practice of physical medicine which must be taken into account when considering the requirements of future training in the specialty. He stated that the problem of training was likely to be confused and inadequate unless the teachers remained students and taught only as they continued to learn. He pointed out that "formal postgraduate residency in physical medicine and rehabilitation, important as it is, can be but one phase of the training of the physiatrist. Training not only must be given to young physicians interested in specialization, but must be given to the specialist for the extent of his professional life. This latter training is the mutual responsibility of all physiatrists . . . and, perhaps most important of all, the responsibility of the professional organizations that represent our field. . . . It seems unlikely that our future will be determined by the continued development of electronic apparatus and exercise routines, particularly as applied to the patients of other specialists. If certain existing problems in medicine appear to be solved best by the skills and facilities of the physiatrist, he must be thoroughly trained in those diseases. Those diseases, in whole or in part, should be considered his responsibility if he consistently achieves the more rapid and complete control of them."

Dr. Bennett continued: "It should be obvious that a residency programme cannot be expected to turn out a finished product, but at best should be considered the most practical means of bringing into sharp focus those problems of diagnosis, prevention, and treatment that come within the responsibility of that field in which the specialist is expected to be expert." He said further that "during these important medical school and internship years, physical medicine must be clearly represented as a specialty, and not only as the study of a group of physical agents with application in practically every field of medicine and surgery". He suggested in outline what he considered the essential content of a residency programme, as follows: (1) training in the basic sciences necessary to intelligent prescribing as well as to personal application of the fundamental physical agents identified with physical medicine; (2) training in the diagnosis, definitive treatment, and total rehabilitation of patients with those sub-acute and chronic diseases affecting bodily movements in which the use

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of physical agents constitutes major therapy; (3) training in departmental supervision and direction; (4) training in the therapeutic purpose, educational background, potentials, or limitations of recognized ancillary personnel upon whom the physiatrist must depend for certain phases of patient care; (5) training in the proper utilization of and co-operation with national, state, and local agencies, both governmental and private, that are capable of assisting the field in its development and the patient in total care; and (6) training in the professional purpose and accomplishments of organizations that represent the field of physical medicine.

According to Dr. Bennett, "The greatest responsibility for the training of the physiatrist, after his residency training is finished, rests with the organizations representing physical medicine and rehabilitation. These organizations must in large part determine the future of this specialty. The very nature of the specialty requires the development of ancillary personnel with extensive and multiple skills. . . . The physiatrist, through his organizations, not only must be taught to develop and guide these necessary skills, but also must be taught the importance of maintaining leadership and control over these groups."

Annual Banquet

At the annual banquet the Gold Key Award of the American Congress of Physical Medicine was conferred on Basil O'Connor for his tireless efforts to improve the lot of the victims of poliomyelitis. Mr. O'Connor, who is a former law partner of the late Franklin D. Roosevelt, has for many years been interested in poliomyelitis, and has been president of the National Foundation for Infantile Paralysis for fifteen years.

In his address following presentation of the award, Mr. O'Connor said that, even with all the progress of the past twenty-five years, we still must be concerned more than ever before with the needs of those who are struggling to overcome disabilities resulting from any disease; that in poliomyelitis research "every advance seems to uncover new areas of need, every accomplishment suggests a new point of attack".

In the course of his speech he gave an outline of the aims of the National Foundation for Infantile Paralysis in the United States of America, together with an account of its work during the past year. When referring to the shortage of personnel for the adequate care of the victims of poliomyelitis, he mentioned that the National Foundation had spent fourteen million dollars in preparing more qualified personnel and in promoting both professional and lay education concerning poliomyelitis. The Foundation has also awarded thirty-six fellowships of one to three years' duration.

He concluded: "To-day, when it seems that science may be approaching the moment when control of paralytic poliomyelitis will become a reality, we, whose specific interest lies with this disease, see only hard work

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ahead. Long after the disease has been conquered, the thousands stricken in the past will need your help. Along with the millions of persons whose lives have been altered by disease and accident, they will look for guidance as they grope for a way of life among their able-bodied fellow-men."

The Second Coulter Memorial Lecture

The late John Stanley Coulter of Chicago is remembered as one of the pioneers in physical medicine in the United States. He was enthusiastic and tireless in his efforts to further development in this field and did much to establish the specialty on a sound scientific basis. The memorial lecture at this meeting of the Congress was given by his great friend, Dr. Frank H. Krusen, who chose as his subject, "Report on the International Congress of Physical Medicine". After paying tribute to Dr. Coulter's memory and his accomplishments, Dr. Krusen presented a detailed report of the First International Congress of Physical Medicine (1952) held in London. He explained the organization of the International Congress and plans for forthcoming meetings. Vivid descriptions of the formal meetings, receptions, and banquets were given. The lecture was beautifully illustrated with slides giving members of the American Congress a clear picture of the places of meetings and of the honoured guests and hosts at the different gatherings. Dr. Krusen summarized the scientific presentations and indicated the principal emphasis of papers and discussion in the symposia and forums which were held. He paid tribute to the hospitality of the British physicians, who carefully planned and cared for all details connected with the programme and the entertainment. In conclusion he stated that a warm feeling of friendship and international amity spread among the 350 guests representing twenty-two nations who attended the banquet and the meetings. He said, "Everyone seemed convinced that physical medicine and rehabilitation had made another tremendous stride forward, and that there was promise of enormous gain in exchange of ideas and promotion of scientific investigation among the physicians of the many nations which were represented."

Scientific Exhibits

There were twenty-five scientific exhibits prepared to demonstrate new devices and new procedures, as well as demonstration by chart, models, and pictures of practical programmes for physical rehabilitation. Rehabilitation of the aged patient; physical medicine and dermatology; rehabilitation in acute myocardial infarction; and treatment of hemiplegia, paralysis agitans, arthritis, and paraplegia, were some of the subjects covered by the exhibits. The gold medal for the outstanding exhibit was awarded to Lieut. Robert Denton and Lieut.-Col. J. N. Schaeffer for their exhibit of a plastic tube designed for continuous administration of oxygen-rich aerosol to the tracheotomized patient being nursed in a respirator. The second

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award went to Drs. W. C. Kubicek and F. J. Kottke, of the University of Minnesota, for their demonstration of gas flow rates during respiration; they showed the importance of using tracheotomy tubes of adequate diameter to supply the needs of the child or adult who is in a respirator or has bulbar poliomyelitis. A third award was given to Drs. R. C. Darling and E. D. Gordon for the exhibit entitled "Integrated Rehabilitation Services at the Institute for Crippled and Disabled". Honourable mention was given to Lieut.-Col. J. H. Kuitert for his exhibit entitled "Prosthetic Training for the Upper Extremity Amputee: Special Problems of Cineplasty", and to Eugene Neuwirth for his special table designed to apply traction to the vertebral column. The exhibitors were available for discussions and explanations of the devices and procedures being demonstrated.

Technical Exhibits

As usual, a large number of technical exhibits were prepared by the manufacturers of all types of equipment used in physical medicine and rehabilitation. New electrical stimulators were shown and latest models of respirators and devices for assisting poliomyelitis patients demonstrated. The exhibitors for the most part were anxious to talk with the physicians and learn of their problems; they appeared to be most co-operative in wanting to improve existing devices and to design and produce apparatus that might be useful to the patient and the physician.

Conclusion

In addition to the inspiration and new knowledge gained from the scientific programme and exhibits, one of the most valuable aspects of a meeting of this sort is the informal exchange of ideas that takes place in small-group discussions as old friends get together and compare problems encountered and achievements made in everyday practice. The older physicians and teachers in the organization are thrilled and encouraged as they see former pupils returning to the Congress and presenting exhibits and scientific papers on work they have done after becoming established. As the American Congress grows in numbers it grows in enthusiasm and strength, and it is ever ready to discuss and to seek solutions for problems that arise. New approaches are being made in the handling of patients; in the training of physicians; in the relationship of the physiatrist to other physicians; and in the training of, and relation of the physiatrist to, ancillary personnel and other groups interested in the rehabilitation of the physically handicapped patient.

The speeches referred to in this account may be read in full in the *Archives of Physical Medicine* for October and November, 1952.

CLINICAL REPORTS

OSTEOMALACIA SIMULATING RHEUMATISM

THE differential diagnosis of a case in which the patient complains of "rheumatic pains" may include almost any disease. The following example is reported because it well illustrates the difficulties involved in this type of case.

Case Report

The patient, a widow aged 62, was first seen in June, 1951. She complained that for the past seventeen years she had suffered from rheumatism, with attacks of pain in various parts of the body. These symptoms were intermittent, but had become more severe and persistent during the past two or three years. The attacks of pain would start in any part of the body and last for a few weeks; they usually cleared up spontaneously. She had not felt really well for several years, and had lost a good deal of weight. She attended a rheumatism clinic, where she was treated by vaccine injections and colonic irrigations without improvement. She did not admit to any symptoms referable to the respiratory or cardiovascular system, but gave a history of rather frequent attacks of diarrhoea and said she had an aversion to fried foods. Nothing helpful was elicited from her past or family history.

On examination she was seen to be pale and thin. No abnormality was found in her heart, lungs, or abdomen; her blood pressure was 150/80 mm. Hg. Her central nervous system was normal. The urine did not contain albumin or sugar. She had a rather stiff dorsal kyphosis, but otherwise her locomotor system was normal for her age.

At the next consultation she said that she had felt a sudden pain in her right foot a few days before; the foot had remained persistently painful, making walking difficult. Examination strongly suggested a march fracture of the third metatarsal, and this was confirmed on X-ray examination. The skiagram also showed a considerable degree of osteoporosis of the whole foot (Plate I), and in view of this further investigations were carried out. The findings were as follows:

Skiagrams of Whole Skeleton.—All the bones were markedly osteoporotic. Pseudo-fractures were seen in the right femur and ischium and in the vertebral border of the left scapula (Plate II). The lower ramus of the right pubis showed an old healed fracture.

Skiagram of Chest.—No abnormality.

Blood.—Haemoglobin, 12.3 g. per 100 ml. (=89% Haldane). Erythrocyte sedimentation rate (Westergren), 13 mm. in 1 hour. Leucocytes, 8,500 per c.mm. (polymorphs, 61%; eosinophils, 3%; monocytes, 3%; lymphocytes, 32%). Wassermann reaction negative. Serum calcium, 6.9 mg. per 100 ml.; phosphates, 3.9 mg. per 100 ml.; alkaline phosphatase, 12 King Armstrong units.

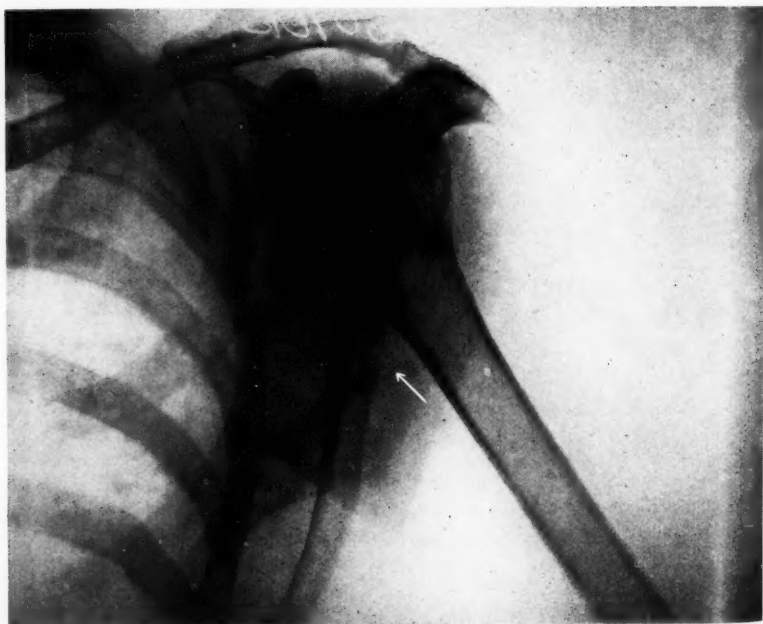
PLATE I



Case of osteomalacia simulating rheumatism. Radiograph showing osteoporosis of right foot, with healed march fracture of third metatarsal.

[face page 218

PLATE II



Case of osteomalacia simulating rheumatism. The arrows indicate pseudo-fractures in right femur and ischium (above) and in vertebral border of left scapula (below).

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Osteomalacia Simulating Rheumatism

Urine.—No albumin, sugar, or Bence Jones protein. Culture sterile.

Faeces.—Total fat, 58.2 %; unsplit fat, 0.2 %; split fat, 58.0% (free fatty acids, 10.2%; soaps, 47.8%).

In view of these findings a diagnosis of osteomalacia due to steatorrhoea was made and the following treatment instituted: high-protein, moderate-fat, low-carbohydrate diet; folic acid, 20 mg. daily; calciferol, 50,000 units thrice daily; calcium lactate, 10 gr. daily. On this regimen the patient improved considerably, and follow-up X-ray examination showed healing of the pseudo-fractures. She has since remained well and has had no further symptoms. There has, however, been no demonstrable change in the osteoporosis, although her serum calcium has returned to the normal level.

Discussion

Generalized skeletal osteoporosis is a not uncommon radiological finding, and is often regarded as one of the physiological changes of advancing years. It may be a feature of such conditions as carcinomatosis, myelomatosis, Cushing's syndrome, or thyrotoxicosis. In the presence of a normal or low serum calcium level, the possibility of primary vitamin-D deficiency or vitamin-D resistance, idiopathic hypercalciuria, Fanconi's syndrome, or malabsorption due to occult steatorrhoea should be considered. The last-mentioned is probably the commonest cause in this group, and the typical findings in the stools in the case reported suggest that it falls into this category.

A. C. BOYLE

Middlesex Hospital,
London.

NEW APPLIANCES

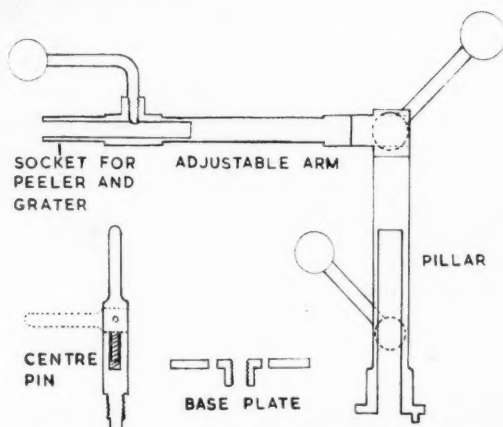
UNIVERSAL HOLDER FOR KITCHEN UTENSILS

AT King's College Hospital a standard fitting which can be attached to various kitchen utensils has been developed in connexion with the kitchen unit for training disabled housewives which has been described by Cooksey (1952). The device is designed for easy and firm fixation and operation, with one hand, of the appliances in everyday use; it is especially useful for women with only one effective hand or with a weak grip in both hands. It has proved efficient in practice and a great advantage over the varying, and not always effective, clamps usually supplied with this type of kitchen appliance. If a similar attachment could be agreed upon as a standard by manufacturers, it should prove a boon to all housewives, and the disabled housewife in particular would have the advantage of obtaining the article at a competitive price.

Construction

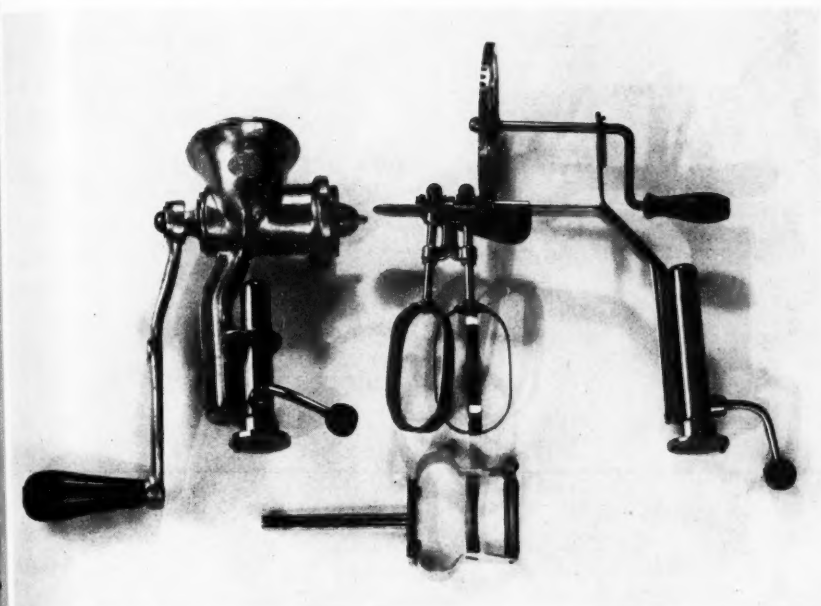
The appliance (see Diagram) consists of:

(a) A base plate fitted in a convenient place on the kitchen table or working bench and countersunk flush with the surface. There is a central threaded hole to receive the centre-pin (b) and a hole off-set to receive a set-pin on the base of the pillar, which serves to prevent any tendency for the appliance to rotate.



Drawing to show construction of base plate, centre-pin, pillar, and universal arm.

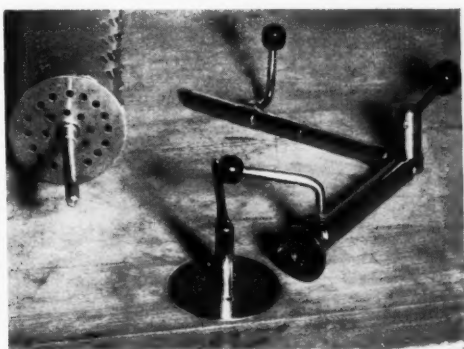
PLATE III



A, Mincer and whisk with pillars attached, and potato-peeler which fits into socket of universal arm.



B

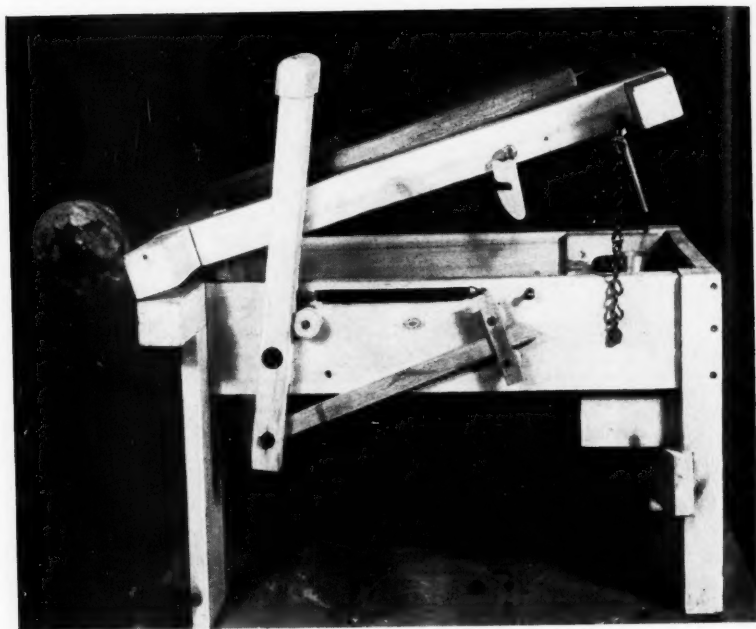


C

B, Grater in position on universal arm and ready for operation over a bowl set into a flap which pulls out from the working bench. This flap is designed to hold bowls steady for the one-armed.

C, Base plate countersunk into bench, with centre-pin, universal arm, and grater.

PLATE IV



The toilet seat released after use.

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Universal Holder for Kitchen Utensils

(b) A centre-pin which is screwed, when the apparatus is in use, into the centre hole in the base plate. A lever at the top is pivoted and, when turned down, serves to tighten the centre-pin. The lever is spring loaded so that after use it returns to the vertical position and thus does not impede the attachment of a pillar (c).

(c) A number of pillars, each made to take a different appliance. On the base of the pillar is a stout set-pin which engages in the hole in the base plate. On the side of the pillar a lever arm and knob operates a locking-screw.

(d) A universal arm, with levers and knobs to lock various joints in the desired position, which is secured to a pillar at one end and fitted with a socket at the other to receive a grater or a potato-peeler. The latter can also be used for scraping carrots, shredding runner beans, and similar operations.

The holder is shown assembled and fitted with various utensils in Plate III.

Acknowledgment

I wish to acknowledge the assistance given by Mr. S. T. Smith, instrument-maker in the Physics Laboratory at King's College Hospital, who designed and constructed the appliance.

REFERENCE

COOKSEY, F. S. (1952) *Ann. phys. Med.*, **1**, 120.

K. A. SOWDEN

Department of Physical Medicine, King's College Hospital.

A TOILET SEAT FOR THE DISABLED

A MEDICAL practitioner who contracted poliomyelitis about two years ago and is left with severe disability—there is paralysis, partial or complete, of all four limbs—is able to walk with callipers, but unable to rise unaided from the sitting position. In spite of his great disability, his tremendous personal courage has enabled him to lead an almost completely independent life, and he is now once again in general practice, seeing patients twice daily in his own surgery.

Owing to his inability to rise from the sitting position, however, he has had to call for assistance when going to the toilet, and this has somewhat marred his independence. The paralysis of his arms is severe enough to prevent him from pulling or pushing himself up, and it was with this problem in mind that the special lavatory seat illustrated in Plate IV was

New Appliances

designed for him. The original idea was his own; the design was perfected and the appliance made in the Remedial Workshops of the Middlesex Hospital.

Structure and Action

An ordinary lavatory seat is mounted in a wooden frame and hinged on to a wooden superstructure which will fit over the normal china stool. When not in use it is kept inclined forward by a heavy lead weight mounted on a steel arm, and two chains at the back prevent the seat from rising more than 45 degrees. When the weight of the body is applied to the seat, it closes down on its hinge to the level position and can be locked in that position by a wooden catch. At the same time two steel rods mounted at the back of the structure descend into two metal cylinders, each containing a strong spring exerting a powerful upward thrust. When the patient is ready to rise from the seat, he releases the catch by means of the long wooden lever. The springs then exert their upward thrust and, aided by the lead weight, throw him into the standing position, enabling him to lock his callipers and walk away.

Acknowledgment

I acknowledge most gratefully the time which Miss Birkbeck and her staff in the Remedial Workshops of the Middlesex Hospital have spent in perfecting the design and constructing the seat.

Middlesex Hospital,
London.

A. C. BOYLE

OBITUARY

By the tragic death of Dr. A. J. Martin on January 6, 1953, at the early age of 43, both physical medicine and all his wide circle of friends have suffered a heavy loss.

Alfred Jack Martin was educated at Rugby School and at Emmanuel College, Cambridge, and received his medical training at St. Thomas's Hospital. He joined the R.A.M.C. at the outbreak of the war and had a distinguished military career, mainly in India and Burma. He was three times mentioned in dispatches, and was awarded the O.B.E. for his services. After the war he returned to St. Thomas's, obtained the Diploma in Physical Medicine, and following a short period as assistant to the physical medicine department at the Royal Free Hospital, on the retirement of C. B. Heald in 1948 he was appointed physician in charge of the medical rehabilitation unit at that hospital. He also held appointments as consultant physician in physical medicine to the Hampstead General Hospital and to the Queen Victoria Memorial Hospital, Welwyn.

Martin was most painstaking and thorough in his work, and always did more than his fair share. Often he would work throughout the lunch hour, sending his assistants out for a meal and carrying on himself. He was unsparing in his attention to his patients, who will greatly miss his kindness and the gentleness so unusual in a busy physician. He was enthusiastic about research, and at the time of his death was actively engaged in the application of radioactive isotope techniques to problems in physical medicine.

Under Dr. Martin the physical medicine department of the Royal Free Hospital became one of the best known in this country and also achieved a high reputation in the U.S.A. All who knew him will miss his genial good nature and comradeship. In the British Association of Physical Medicine he was well known for the support he gave the younger members, and the Registrars group, in particular, have lost a good friend.

His publications were many, and included the chapter on electrotherapy in the *British Encyclopaedia of Medical Practice* and also papers on radioactive isotopes, resettlement, fibrositis, and peripheral vascular disease. In his teaching his students at the Free appreciated the practical common sense of his approach to a difficult part of the syllabus. His relations with his registrars, house-physicians, and physiotherapy staff were particularly good, and the "M.R.U." was indeed a happy department in which to work. The resettlement clinics which Dr. Martin introduced at the Free were an outstanding success.

Though feeling ill himself, rather than disappoint his patients he insisted on finishing a long and exacting clinic at Hampstead General Hospital. He died a few minutes later from a coronary thrombosis. He was a devoted family man, and leaves a widow, two sons, and a daughter, to whom our sympathy goes out.

R. H.

BOOK REVIEWS

Physical Medicine in General Practice. Edited by WILLIAM BIERMAN, M.D., and SIDNEY LICHT, M.D. 3rd Edition, revised and enlarged. London: Cassell and Co., Ltd. Pp. 832. 93s.

Bierman's *Physical Medicine in General Practice* needs no introduction to practitioners of physical medicine. There are 22 contributors to the present edition, which appears under the combined editorship of William Bierman and Sidney Licht. The arrangement follows previous editions. The book is in two parts, the first fifteen chapters being devoted to physical methods with descriptions of physiology, apparatus, and techniques, while the remaining fourteen chapters deal with physical methods under disease headings.

The editor of the first edition states in his preface that his aim was to "tell the practitioner in general and special fields of Medicine how he might use physical measures with the others which he employs in his effort to be of service to his patients". On reading the book, however, it is clear either that this original intention has been forgotten or that general practitioners in the United States employ physical medicine in quite a different fashion from that usual in this country, where the only demand for a book of this size and comprehensiveness is among physical medicine specialists.

The practice of preceding each chapter with the relevant physics and physiology as is done in Part I is, I believe, very sound and desirable, but one could have wished for less of the repetition which occurs, and which might have made way for more up-to-date and relevant material in certain chapters. For example, in the chapter on heat and cold the most recent reference to the autonomic nervous system is 1938, and a discussion on modern concepts of the physiology of pain, which might have been included in this chapter, appears nowhere in the book. In the chapter on hydrotherapy only one and a half of 29 pages is devoted to the use of this method for exercise; this does not accord with current British practice.

The interesting chapter on climatotherapy and spa therapy is, unfortunately, not very helpful to us in this country, since our own spas and climate—perhaps wisely—are not discussed! In this regard one can heartily agree with the quoted remarks of Pottenger: "I would rather be treated intelligently in the worst climate than be allowed to run wild in the best."

There is a very good account of micro-waves in the chapter on diathermy, and ultrasound, with a chapter to itself and a full bibliography, is excellently and impartially discussed. Although comparatively short, the chapter on manipulation by Bastow is first-class, being completely devoid of redundant material and repetition, yet retaining crisp and clear observations of the writer's viewpoint. "Exercise", by DeLorme, is also excellent, as those familiar with his work would expect. The principles of medical rehabilitation and occupational therapy are ably dealt with by Licht in two chapters, though occupational therapy in Britain is now, I think, somewhat in advance of the account given here; and, of course, our own social services and legislation, which are an integral part of the problem

Book Reviews

of rehabilitation in this country, are not treated. This also applies to a useful chapter on "The Conduct of Treatments".

One would have expected in a book of this size a chapter on electrodiagnosis, and its omission is the more remarkable considering that a separate chapter is devoted to surgical diathermy, which does not form part of British physical medicine. Similarly, in Part II there are chapters on diseases of the genitourinary and digestive systems, and yet no mention is made of antenatal exercises, the Bisgaard treatment of varicose ulcers, or the role of physiotherapy in chest surgery.

In spite of these criticisms, some of which are due to the differences between British and American physical medicine practice, this book can be thoroughly recommended. As the best complete work available it will prove useful, not only to those reading for the Diploma, but also as a work of reference for all other practitioners interested in physical medicine.

DONALD FLETCHER

Physical Education in England since 1800. By PETER C. MCINTOSH. London: G. Bell & Son, Ltd. Pp. 258. 15s.

This book provides an excellent review of the growth of physical education. The author contrasts the two main lines of development of our modern system of physical education: (1) in the public schools, and (2) in the elementary council schools. In public schools, games developed, largely by the boys' own efforts, from the disorganized outlet of high spirits to the modern team games; gymnastics were late in finding a place. In the elementary council schools, on the other hand, drill was introduced as a means of maintaining discipline, and developed to the Swedish system; games had no place until the present century. The part played by individuals in developing the two lines and persuading the Education Board and Government to accept, encourage, and finally enforce these advances is described in considerable detail. The reader tends to lose himself in the mass of names, but there is a good index for reference.

The manpower demands of war were closely correlated with the introduction of military drill and gymnastics to schools, and in the early stages instructors and supervisors were drawn almost entirely from the Services, giving the War Office a considerable say in policy. The first link between the Services and the education authorities was maintained up to 1931, when the Education Board finally cut itself adrift from military influence; the effects of this, both good and bad, and its influence on physical education, are clearly drawn.

The last chapters sketch the growth of recreational training in schools and youth clubs and its integration into physical education.

J. M. MILNE

ABSTRACTS OF THE LITERATURE

The Senescent Human Vertebra: Contribution to Human Osteogeny—III. E. M. BICK and J. W. COPEL. *J. Bone Jt Surg.*, 1952, **34A**, 110.

The process of senescence in the human vertebra uncomplicated by pathological endocrine disturbance is characterized by three histological reactions. Only one of these is directly physiological; the other two are the products of extraneous influence. The fundamental characteristic is loss of trabecular substance owing to failure of formation of collagen while its normal, or possibly accelerated, absorption continues. This inverted reaction may be regarded as the natural process of deossification. A second manifestation, which may start many years earlier and is often, but not necessarily, present, is that of osteophytosis about the periphery of the cephalic and caudal margins of the vertebral body. This is particularly prominent along the line of the anterior longitudinal ligament. It is a proliferative reaction of subchondral bone to the wear and tear of the articulating cartilaginous surfaces. The third histological characteristic is to some extent always apparent. One or more small areas of localized avascular necrosis or infarct spread through the spongiosa. These may be numerous in specimens from aged subjects, but have not been seen to coalesce and, therefore, do not apparently become large enough to cause gross collapse of the vertebrae.

It is evident that the appearance of osteophytosis in an aged spine cannot be passed off simply as arthritis, nor can the appearance of a usual degree of spotty lysis in a senescent vertebra be classified as pathological osteoporosis.

O. F. VON WERSSOWETZ

Prophylaxis of Scoliosis. A. M. ARKIN. *J. Bone Jt Surg.*, 1952, **34A**, 47.

In this article the author describes a method of prophylaxis of a common type of idiopathic scoliosis. The principal characteristic of structural scoliosis, and one which makes it so difficult to treat, is its tendency to become progressively worse while growth continues. When growth ends, progression stops, leaving the spine permanently frozen in the position of deformity.

The basis of this phenomenon lies in the fact that pressure arrests epiphyseal growth. The vertical spinal column of all bipeds is continually being compressed by the action of gravity. So long as the spine, as viewed from the front, is straight, the pressure of weight-bearing is evenly distributed between the right and left halves of each growing vertebral epiphyseal plate. Hence any growth arrest due to pressure induced by gravity will be symmetrical, and no lateral deviation due to unequal growth will occur. On the other hand, a functional curvature inevitably produces an asymmetrical distribution of gravitational pressure in the right and left halves of the upright spine, and considerable compression may develop in the concavity of the curve. The vertebral bodies which are unequally compressed will grow unequally, yielding in time the wedged vertebrae of structural scoliosis. It should be noted that structural scoliosis may develop and progress solely by the action of gravity upon a functional curve, without preceding muscle weakness or soft-tissue contracture. Despite the facts that no such contractures are found in idiopathic scoliosis and that division of the soft tissues in the concavity of the curve is known to be ineffectual, the

Abstracts of the Literature

notion of a contractual aetiology has been difficult to dispel. Nevertheless, all the available evidence points to the fact that in idiopathic scoliosis, gravity, acting upon a spine made vulnerable by a functional curvature, is the only deforming force. Removal of either of these two essential factors will prevent the development of structural scoliosis, or, if it is already present, stop its progression. Prolonged recumbency is hardly an acceptable method of prophylaxis: a better method is to correct the functional curve before it becomes structural.

Scoliosis with a C-shaped curve may be corrected by using the pelvis as a convenient lever or handle rigidly attached to the spine. The author recommends the use of lifts under the heel on the side of the curve. The lifts should be high enough to raise the pelvis sufficiently to straighten out the curve. He believes that, with the functional curve corrected, the spine is no longer vulnerable to gravity-induced structural changes. The tendency to curvature must also be combated in the sitting position by producing appropriate pelvic tilt, for which purpose a book may be used. Finally, the curvature can be reversed in recumbency by propping up the torso on the elbow of the opposite side. A hammock may be used in place of a bed.

The author emphasizes the fact that a high lift should be used as tolerated, usually $1\frac{1}{2}$ to 2 inches more than the opposite side, depending on the size of the patient. The effect of these lifts on the curve should be checked radiographically.

O. F. VON WERSSOWETZ

Orthograms of Posture. C. W. GOFF. *J. Bone Jt Surg.*, 1952, 34A, 115.

Man's posture has been a subject of intense interest to all those concerned with body mechanics. The author, whose aim has been to establish the determination of posture on a scientifically sound basis, has reviewed the relevant literature, and concludes that the orthograde posture of man as typified by a lateral view or profile, taken with the subject standing erect and at ease, perpetuates an error. This error consists in representing back curves as static, unchanged in profile views, while the abdominal outline is seen to be gradually cut away from the heavy, through the intermediate, to the slender body type.

For classification of postures the author used Sheldon's method as modified by Hooton. The fundamental body builds were classified as linear, muscular, and fat. A fourth fundamental body build was identified and called muscular-balanced or the "average man" body type.

This study is based on material obtained from a series of laboratories, set up by the U.S. Army Quartermaster Corps at separation centres throughout the country, geographically placed for an objective sampling of the young male population. Nearly 100,000 young adult males were photographed and measured. From this group, probably the largest available for the study of posture, 40,000 photographs were selected for the excellence of the photography without in any way impairing the objectivity of the group selected. These photographs were examined and analysed in the Department of Anthropology at Harvard University. Trained classifiers of body types selected photographs of representative types, and these were projected by a stereopticon to form standard 10-inch images. Then the lateral photographs were traced on thin paper and superimposed on others to obtain the mean for each body type, the lumbo-sacral junction in each tracing being used as the common point of superimposition.

Abstracts of the Literature

The final mean orthogram of each body build proved to be astonishingly characteristic of that particular constitutional type, and each type had a characteristic postural stance which was considered normal for that type of person.

The incidence of these four body types was: fat type, 10.99%; muscular type, 10.87%; thin elongated type, 18%; and the muscular-balanced or "average-man" type, 26.02%. The remaining 34.12% of body builds were all grouped under the general classification "intermediate types". These were too few to have statistical significance.

[This paper should be of basic interest to physiatrists and other ancillary personnel in the field of physical medicine who are interested in body mechanics.]

O. F. VON WERSSOWETZ

Causes and Treatment of Sciatica. C. H. MILLIKAN. *Postgrad. Med.*, 1952, 12, 207.

The author defines sciatica as a pain which begins low in the back, extends into the buttocks and posterior aspect of the thigh, and often into the calf or ankle or even the foot. There are three sites of origin: the sciatic nerve, the lumbo-sacral plexus, or the sciatic nerve roots. In 90% of cases sciatica may be attributed to nerve-root lesions—usually the pressure of a protruded intervertebral disk. A new diagnostic procedure is recommended. Without warning the patient's head is suddenly flexed on his chest and the patient asked if he felt pain and where. If pain was felt in the back or along the distribution of the sciatic nerve the presence of organic nerve-root irritation is indicated.

According to the author treatment is conservative or surgical. By conservative he means rest on a hard bed for two to three weeks. "It is frequently helpful to put some heat on his back and have some massage given. Try to give him something to do while he is at rest, at least for the first few days of this ordeal. When he gets up, tell the patient to lift objects with the transmission of effort to his legs and to keep the lower back rigid." Of 500 patients studied, 50% of those treated surgically, but only 30% of those treated conservatively, were able to return to full employment in their former job.

SIDNEY LIGHT

Tables for Vertebral Elongation in the Treatment of Sciatica. E. NEUWIRTH, W. HILDE, and R. CAMPBELL. *Arch. phys. Med.*, 1952, 33, 455.

In this paper sciatica is briefly defined and its aetiology discussed. The authors conclude that 95% of patients suffer from lesions involving spinal nerve roots. The great majority of these are due to some basic joint lesion, disk protrusion and its complications being the chief pathological change present. The factors producing such lesions are reversed by vertebral elongation, and its use in treatment therefore appears logical.

The simple traction table designed by Lucien Godet is described, as also is its modification by Neuwirth and Campbell, which allows for its use in cases requiring cervical traction. The technique of treatment using this apparatus is outlined and the results obtained in 13 patients with sciatica are mentioned. To these results are added those obtained by others employing similar methods in a total of 796 patients.

Abstracts of the Literature

The authors consider that vertebral traction exerts significant beneficial effects in patients with sciatica. [No attempt has been made to indicate the clinical basis on which selection of cases for traction should be made. The technique is only outlined, and those with some experience of spinal traction may find many questions unanswered. As a preliminary report, however, the paper will prove of great interest to those who face the vast problem of treatment for lesions of spinal joints, and the simple traction table which is described and illustrated appears to be an excellent prototype.]

I. H. M. CURWEN

Treatment of Rheumatoid Arthritis with Butazolidin. J. P. CURRIE. *Lancet*, 1952, **2**, 15.

In this paper is reported an investigation of the effect of a new drug, "butazolidin" (phenylbutazone), on 81 patients suffering from rheumatoid arthritis. Butazolidin—a pyrazolidine derivative and the solvent used for the amidopyrine preparation "irgapyrin"—was administered by injection or by mouth. The author claims marked relief of pain and stiffness and, in some cases, a reduction in joint swelling and fall in the erythrocyte sedimentation rate.

Closely following this paper, Hart and Johnson (*Lancet*, 1952, **2**, 43), Bach (*ibid.*, 1952, **2**, 92), and others have reported on the use of this drug. Butazolidin is agreed to be of definite value in relieving pain and stiffness in rheumatoid arthritis and sometimes in osteoarthritis, gout, and the various forms of non-articular rheumatism. Complications, such as skin rash, water retention, haematemesis, and abscess at the site of injection, have been recorded.

[This drug is almost certainly not curative, but can play a useful role in clinical practice. It is of interest to physicians who practise physical medicine, as it has been found to be of value as the first step in the management of a patient with rheumatoid arthritis who (1) is starting a course of gold injections, or (2) is about to have physical treatment, manipulations, or the application of plasters, or (3) is put on the waiting list for admission to hospital.]

FRANCIS J. BACH

The Effect of Meteorological Factors on Rheumatic Arthralgia with Special Reference to Atmospheric Electricity of Ankara. Ş. DIRISU. *Bull. Fac. Med. Ankara*, 1952, **1**, 73.

The atmosphere of Ankara usually contains a predominance of negative ions. In a series of 116 patients suffering from some form of rheumatism, changes in atmospheric ionization were found to be associated with the symptoms manifested: pain increased in proportion to the increase of positive ions in the atmosphere. In Istanbul the air is usually neutral in charge, and when natives of that city who suffer from arthralgia settle in Ankara, their pain is increased because of the atmospheric change. The author does not believe that symptoms vary with cold and humidity. In very cold weather, relief of pain was found, whereas on days of low humidity the pain increased; but these are not important except when associated with ionic variations. Intensification of pain did not accompany changes in wind direction or atmospheric pressure.

A. LAQUEUR

Abstracts of the Literature

A Remedial Occupational Therapy Program for the Residuals of Rheumatoid Arthritis of the Hand. D. L. ROSE and L. I. WALLACE. *Amer. J. phys. Med.*, 1952, **31**, 5.

The authors point out that the most common hand deformity in late rheumatoid arthritis includes flexion of the metacarpo-phalangeal joints—an observation at variance with previous reports, but one easily confirmed by clinical inspection.

This unusual paper approaches occupational therapy for hand deformity from a purely mechanical engineering angle. Lines of force based on muscle pull are analysed and methods designed to counteract undesirable pulls of progressive disease. To correct flexion deformity the patient finger-paints with one hand while the other presses down on the flexed joint. To prevent ulnar deviation of the fingers, a sanding block is built up for the lateral border of the hand and built down for the internal border.

SIDNEY LIGHT

The Diagnosis and Treatment of Chronic Backache. A. C. BOYLE and B. E. W. MACE. *Med. Press*, 1952, **228**, 33.

The authors have compressed into a neatly classified review a wide clinical problem. They use as a basic classification the well-known analysis of 2,000 cases of back pain produced by the staff of the Mayo Clinic; of necessity the less common conditions causing chronic backache have been omitted.

The idea of using two main groupings, that of backache in adolescence and early adult life and of backache in the older patient, is a good one. All important causes in both groups are listed, and the suggested treatments are the conventional ones applied in physical medicine departments. [Although postural backache is listed, readers may feel that the backache which occurs secondary to scoliosis, sometimes referred to as idiopathic, might have been usefully included and discussed.]

A. B. COYER

Ankylosing Spondylitis. H. F. TURNEY. *Med. Press*, 1952, **228**, 41.

This paper contains an excellent discussion of the aetiology, diagnosis, and treatment of this disease. The author stresses the need for early diagnosis so that the advantages of early effective treatment in the form of X-ray therapy may be obtained. Of even more importance, the early physical education and routine of the patient that may be instituted, and so prevent as far as possible the crippling deformities often seen in later life, are discussed.

A. B. COYER

Exercises following the Bankart Operation for Recurrent Shoulder Dislocations. J. D. RUDD and E. K. HAYDOCK. *Arch. phys. Med.*, 1952, **33**, 353.

In order to assess the value of exercises after Bankart's operation, 40 patients who had undergone this procedure were divided into two groups, one group (16 patients) being given closely supervised exercises starting three to four weeks after operation, the other group (24 cases) receiving no supervised exercises. The exercises included gravity-eliminated abduction, external and internal rotation exercises, exercises in a Hubbard tank, and active assisted exercises with ceiling pulleys.

Abstracts of the Literature

The group receiving planned exercises achieved full movements and power, and returned to duty in two and a half months after operation; the unexercised group of patients took five months. The latter group all received "exercise advice", but the authors point out that patients neglect their exercises unless supervised. They stress the importance of simple apparatus in shoulder exercises.

C. B. WYNN-PARRY

Function of the Quadratus Lumborum. M. E. KNAPP. *Arch. phys. Med.*, 1951, 32, 505.

The author believes that the quadratus lumborum is fan-shaped rather than quadrate, and that the traditional method of testing does not properly evaluate its action, since its chief function is elevation of the pelvis. Thus, instead of testing the muscle in the prone or supine position, "it can be tested only in the standing position. At least, the oblique fibers can be tested only in the standing position." The patient stands (and it can be tested only if the patient is able to stand) and is asked to raise each foot off the floor alternately. If the pelvis droops when a foot is lifted, the opposite quadratus is weak. Paralysis of the oblique fibres is one cause of scoliosis. A clinical application is suggested: fasten the two bony attachments with fascial strips or metal mesh in patients with such scoliosis.

SIDNEY LIGHT

Therapeutic Application of Ultrasonic Energy. F. FRIEDLAND, J. G. BISGROVE, and B. J. DOYLE. *Arch. phys. Med.*, 1952, 33, 461.

The authors give a brief outline of the history, physical properties, and therapeutic uses of ultrasonics, followed by an account of results obtained in the treatment of 141 patients. Results have been carefully controlled by random selection from the notes of similar cases treated by established physical methods. The discussion of these results is outstanding for its impartial appraisal of the complex factors concerned in the assessment of any group of cases of the type which are presented for treatment by physical methods. Due emphasis is laid upon the fact that almost all such cases are self-limiting, and will therefore appear to benefit from any form of treatment applied. Certain cases are discussed in detail to illustrate the possible beneficial effects of ultrasonic therapy.

The authors draw three conclusions: (1) that ultrasonic therapy can be considered safe in the hands of qualified operators; (2) that it has a beneficial analgesic effect equal to that of other physical agents, such as infra-red rays and diathermy; (3) that it has no other specific curative effect. They consider that this form of treatment is convenient and useful as an alternative physical agent because of its ease of application and short duration. They state, however, that many years of careful study will be needed before a final conclusion is reached on the therapeutic use of ultrasonics in medicine.

[This paper appears to be the most valuable contribution which has so far appeared in the literature of English-speaking countries upon the subject of ultrasonic therapy. The adequate bibliography gives the key to the majority of significant articles which have appeared in recent years and should prove of special value to those approaching the subject for the first time.]

I. H. M. CURWEN

Abstracts of the Literature

Ultrasonic Therapy in the Treatment of Hypertrophic Arthritis in Elderly Patients.

J. H. ALDES. *Ann. west. Med. Surg.*, 1952, 6, 545.

Over an eighteen-month period 311 patients with arthritis were treated with ultrasound. Of these, 233 were followed up for twelve months. The chief complaint in this group, whose average age was 62, was back pain of 2 to 10 years' duration, unrelieved by other measures. The author reports: 103 showed apparently permanent improvement, 63 partial improvement, and 67 no improvement. Patients received a total of 8 to 12 exposures at 2-day intervals.

SIDNEY LICHT

The Treatment of Hyperhidrosis of Hands and Feet with Constant Current.

D. BOUMAN and E. G. LENTZER. *Amer. J. phys. Med.*, 1952, 31, 158.

Aluminium chloride is the most common active ingredient of deodorants. The authors found that ion transfer with this substance stopped sweating of the hands for six weeks. Equally good results were obtained with the use of the constant current without aluminium. The degree of sweating was determined by a simple effective test in which moisture on the palmar surface acted as "ink" when brought into contact with chemically treated paper. Success was encountered in 103 of 113 patients suffering from palmar sweating severe enough to warrant medical attention.

The treatment, which must be repeated every six weeks (since this gives relief but does not cure), is simple. Fissures or abrasions of the hand are coated with cold cream to prevent stinging. The hands are placed in two metal trays of the kind used in photography, each tray containing a layer of cotton-wool resting on a sheet of aluminium foil connected to the galvanic generator, which is submerged in tap water. The current is applied for about ten minutes each session daily. On successive days the polarity is changed. The number of treatments required varied from 5 to 13, and treatments were continued until symptoms disappeared.

SIDNEY LICHT

The Production of Rectangular Voltage and Current Pulses. A. HAY. *Physiotherapy*, 1952, 38, 135, 155.

In this article the author describes basic circuit theory and pulse-generating circuits of the type used in electronic square pulse muscle stimulators. Thus from a consideration of the use of valves as switches he leads up to a discussion of C-R timing circuits and ultimately to a description of multivibrator circuits. A reference to the differences between constant-current and constant-voltage outputs is included.

[This article will fill a gap in the available literature on electrodiagnosis and, in combination with the article by Buller and Styles (*Ann. phys. Med.*, 1952, 1, 37) on some technical factors affecting the accuracy of recording in electromyography, and that by Parnum (*Wireless World*, 1945, 51, 337, 373) on biological amplifiers, supplies all the technical information required for electrodiagnosis by use of intensity duration curves and electromyography.]

A. T. RICHARDSON

Abstracts of the Literature

Studies of the Effect of Massage on the Flow of Lymph from the Foreleg of the Dog. M. P. LADD, F. J. KOTTKE, and R. S. BLANCHARD. *Arch. phys. Med.*, 1952, 33, 604.

In 17 dogs anaesthetized with pentobarbitone a blue dye was injected between the digits of their forepaws after a cannula had been inserted into the large lymph channel of the neck. Three physical agents were applied to the injected leg: massage, passive motion, and electrical stimulation. The first two agents caused the mean lymph flow to increase 4.3 and 2.6 times respectively, while electrical stimulation had no effect. The results of von Mosengeil's experiments and the claims of Hoffa in relation to the clinical use of massage advanced half a century or more ago were confirmed.

SIDNEY LIGHT

Effect of Massage on Muscle Temperature and Radiosodium Clearance. A. EBEL and L. H. WISHAM. *Arch. phys. Med.*, 1952, 33, 399.

In this study of the effects of massage on the extremities of 10 normal subjects the authors show that it is not an effective method for increasing blood flow to muscles. In contrast, they were able to confirm the value of massage for increasing circulation to the skin.

[These results recall the work of Wakim *et al.* (*Arch. phys. Med.*, 1949, 30, 135), who, using venous occlusion plethysmographs, were also unable to show any consistent or significant average increase in total blood flow resulting from massage (including deep stroking and kneading) in normal subjects, in cases of rheumatoid arthritis, or in patients with spastic paralysis. These workers did, however, demonstrate a moderate increase in blood flow to the extremities of subjects with flaccid paralysis. Further, the work of Ladd *et al.* (*ibid.*, 1952, 33, 604) on the effect of massage on the lymph flow in the foreleg of dogs showed that massage, passive movements, and electrical stimulation all produced an increase in lymph flow, massage being the most effective.

Studies on the effect of massage on human lymph flow are clearly indicated.]

A. T. RICHARDSON

Electrical Tests of Nerve and Muscle. P. BAUWENS and A. T. RICHARDSON. *Med. Press*, 1952, 228, 38.

This excellent little annotation emphasizes the great strides made in recent years in this subject. Interest in the use of such an accurate routine as that based on intensity duration curves and electromyography is widespread, for it is obvious that electrodiagnosis is becoming the court of appeal in many neurological problems, as regards both accurate diagnosis and prognosis. This article supplies an account of these methods suitable for the non-specialist. Diagrams illustrate the normal and abnormal intensity duration curves and their interpretations. The appearance of electromyographic potentials on the oscillograph in normal and pathological states is described in simple terms.

[Surely it is time that this team, who have contributed so much to this subject, produced a handbook of electromyography for the curious but uninitiated.]

A. B. COYER

BRITISH ASSOCIATION OF PHYSICAL MEDICINE

WEEK-END POSTGRADUATE COURSE

A POSTGRADUATE course in Physical Medicine was held on January 31 and February 1, 1953, at the Middlesex Hospital, by kind permission of the Board of Governors.

The course opened with a clinical demonstration by Dr. A. C. Boyle of six cases to illustrate some of the difficulties in the differential diagnosis in patients whose presenting symptom is "rheumatism". A lecture by Dr. P. Bauwens followed on "Recent Advances in Electrodiagnosis". The lecturer described some of the recent theoretical work in connexion with electromyography, which he illustrated with many interesting electromyographic tracings. During the third session Dr. C. S. J. O'Malley discussed "Recent Advances in Rehabilitation", in which he not only described his own pioneer work at Garston Manor, but also dealt with some of the international work at present being carried out in this field.

Dr. H. F. Turney gave the first lecture on the second day, on "Recent Advances in Rheumatology", in which he described the latest forms of treatment, both physical and pharmacological, for this group of diseases. Dr. A. T. Richardson followed with "Recent Advances in Physical Treatment". The formal lectures closed with an account by Dr. F. S. Cooksey on "The Organization of a Physical Medicine Department".

The course ended with a brains trust, in which members of the audience submitted questions to a panel consisting of Dr. O'Malley (chairman), Dr. P. Bauwens, Dr. Turney, and Dr. Cooksey.

This was the first postgraduate course of its kind to be held, and the response was extremely encouraging.

It is with deep regret that we record the deaths of DR. HAROLD BALME and DR. JOSEPH BARNES BURT. Dr. Balme, who died on February 13 at the age of 74, was Consultant Adviser on Rehabilitation to the United Nations and World Health Organization and formerly Consultant Adviser on Rehabilitation to the Ministry of Health. Dr. Burt, whose death at the age of 72 occurred on March 18, was the first President of the Section of Physical Medicine of the Royal Society of Medicine.

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[Photograph by St. Thomas's Hospital Photographic Department]

Cup presented to the Royal College of Surgeons on behalf of the
International Congress of Physical Medicine (1952)

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